personality was forceful, interesting and lovable. Endowed as he was, it may seem strange that he did not establish a school of chemistry in Cork. But the reason is not to be found in the man—rather in his surroundings. Placed, as he was, in a sparsely populated district, where poverty is, unhappily, the rule, where chemical manufactures are but few, and where the demand for highly trained chemical knowledge of any sort is practically non-existent, the result flowed almost inevitably from the conditions.

At various times he acted as examiner in chemistry to the Civil Service of India, the Civil Engineering College, Coopers Hill, and the Royal Military Academy, Woolwich; he was an Honorary Fellow of the King's and Queen's College of Physicians; received the degrees of M.D. and LL.D. (both *honoris causa*) from the University of Dublin; was a senator of the Queen's University; Fellow of, and examiner in, the Royal University of Ireland, from which he received the degree of D.Sc. (*honoris causa*); he was also selected as president of the section of chemistry of the British Association at its meeting in Dublin in 1878. In addition, he was for several years a member of the council of the Chemical Society, by which he was elected, during the years 1872–74, to the office of vice-president.

On February 26, Maxwell Simpson passed away in London; his work remains, a worthy and enduring memorial to his love for that science which he so generously enriched. A. E. DIXON.

NOTES.

PROF. E. C. PICKERING announces that he has received from a friend a gift of twenty thousand dollars (4000*l.*) for the benefit of the Harvard College Observatory. It is proposed to expend about one-half of this fund in extending the present building in which the astronomical photographs are kept, so as to provide for the adequate storing of this collection with its probable increase for many years. These photographs furnish a history of the entire stellar universe for the last twelve years, and is not duplicated elsewhere. A portion of the remainder of the gift will be used at once to provide for the study of objects of interest on the photographs, as hitherto only those of special importance have been examined.

THE Raoult Memorial Lecture of the Chemical Society was delivered by Prof. van 't Hoff on Wednesday of last week. Shortly after Raoult's death, a year ago, a short account of his career was given in these columns (vol. lxiv. p. 17). Prof. van 't Hoff remarked that the scientific work could be conveniently considered as belonging to three periods of Raoult's life—physical, chemical and physiological. As a typical research of the first period he mentioned the study of the heat evolved by chemical reactions in the voltaic cell and that due to the electric current. Later, Raoult directed his attention to subjects of a more purely chemical nature, such as the influence of solar radiation on the inversion of cane sugar, and the absorption of ammonia by saline solutions. His physiological work included studies of the presence of copper and zinc in the animal organism and the influence of carbon anhydride on respiration. But Prof. van 't Hoff pointed out that the researches which made Raoult's name famous as a scientific investigator were those which led to the establishment of a definite connection between the lowering of the freezing points and of the vapour pressures of solvents by the presence of dissolved substances. This led Prof. van 't Hoff to the important generalisation that the osmotic pressure of a dissolved substance bears a definite relationship to the pressure it would exert if it were in a state of vapour—a theory which has been of immense service in elucidating the nature of solutions and has also led to the theory now widely accepted as to the existence in dilute salt solutions of the ions of the dissolved substance.

WE regret to see the announcement of the death on Good Friday of Mr. G. F. Wilson, F.R.S., whose scientific work included the discovery of the means of obtaining pure glycerine, and numerous papers on horticultural subjects. Mr. Wilson was in his eightieth year.

LORD KELVIN is expected to arrive in New York on April 19. *Science* states that a reception will be given in his honour on the evening of April 21 by Columbia University, the American Institute of Electrical Engineers, the New York Academy of Sciences and other scientific societies.

ON Tuesday next, April 8, Dr. Allan Macfadyen will deliver the first of a course of three lectures at the Royal Institution on "Biological Inquiry"; on Thursday, April 10, Prof. Dewar will begin a course of three lectures on "The Oxygen Group of Elements." The Friday evening discourse on April 11 will be delivered by Prof. Dewar on "Problems of the Atmosphere," and on April 18 by Sir John H. A. Macdonald, his subject being "The Autocar."

THE Berlin correspondent of the *Times* states, upon the authority of the *Lokalanzeiger*, that a scheme is under consideration by the German Imperial authorities in accordance with which the chief commercial nations, especially England, France and the United States, will be invited to send representatives to an international congress, the object of which will be to arrive at an agreement forbidding the establishment of any monopoly in wireless telegraphy on the high seas. This step, it is stated, is the direct consequence of the refusal of the Marconi station on the Nantucket lightship to enter into communication with the *Deutschland* during its homeward journey with Prince Henry of Prussia on board.

WE learn from the *Times* that the University of Chicago has commissioned Mr. Alleyne Ireland to report on the financial, commercial and social conditions of all the European colonies in the Far East, where the circumstances appear both geographically and historically to bear some resemblance to the general situation of the Philippines. Mr. Ireland will visit Burma, Siam, the Federated Malay States, the Straits Settlements, Sumatra, Java, British North Borneo, Sarawak, French Indo-China, Tonking, Formosa and Hongkong. After making an investigation of the general condition of the Indo-Malayan people under British, Dutch, French, and native rule, he will then go to the Philippines in order to examine the conditions of those islands from the comparative point of view. It is anticipated that his inquiry will occupy about two years.

AT the request of the U.S. Senate, the Secretary of Agriculture has reported upon the condition of the American bison. In his summary he states that this species is on the verge of extermination. Scarcely a handful now remain of the millions which formerly roamed over the plains of the west. Only two small herds of wild buffalo are in existence in the United States—one in the Yellowstone Park, the other in Lost Park, Colo. There are no wild buffalo in Canada, except in the Peace river country, where a few woodland buffalo, believed to be a different species from the American plains buffalo, still exist. A number of buffalo have been domesticated and half-domesticated, there being three important herds in addition to the small herds in zoological parks and in the hands of private individuals. It is suggested that if the Government would acquire possession of a considerable number of full-blooded animals the absolute extermination of the species might be long delayed.

THE fourteenth International Medical Congress will be held at Madrid on April 23-30 of next year. The *British Medical Journal* states that in almost all the countries of Europe and America local organising committees have been formed. The Spanish Minister for Foreign Affairs has invited all Governments to send representatives. A similar invitation has been sent to all universities and medical schools, and to the principal medical societies in all countries. Among the numerous applications for membership which have up to the present been sent in are the names of eighty-five delegates, and there is every prospect of a most successful meeting. Among the notabilities of the medical world who have promised to deliver addresses are Profs. Pavlov, Maragliano, Thomson, Laache, Waldeyer, Cajal and others. Almost all the various sections have arranged their programmes of discussions, and they are now grappling with the task of selecting men to open them. A preliminary programme, including not only the official list of discussions, but the titles of communications offered, will shortly be issued.

As already announced, the jubilee of the scientific career of the eminent palæontologist, Prof. A. Gaudry, was celebrated at Paris on March 9, when many of his old pupils, friends and admirers assembled to do him honour and to offer him a medal commemorative of his services to science. Delegates were present from numerous learned societies and academies, including our own Royal Society; and addresses were delivered by M. E. Perrier, director of the Natural History Museum, where the celebration was held, M. M. Boule and M. Liard. The accompanying illustrations from *La Nature* show the medal which was presented to Prof. Gaudry as a slight mark of appreciation of his work in palæontology and the honour it has brought to France and to the museum with which he has been so long connected as student, assistant naturalist and professor.

THE Russian Geographical Society has sustained another heavy loss by the death of General Mikhail Vasilievich Pyevtsoff. He was born in 1843, received his education in a military school, and next in the Academy of the General Staff, and after having finished his studies remained for fifteen years at the General Staff at Omsk, making important journeys in Dzungaria and north-western Mongolia. He also took part in the great surveys which were made in 1880 on Chinese territory in connection with the tracing of the boundary between China and Russia. The results of the first two journeys were embodied in papers published in the *Memoirs* of the West Siberian Geographical Society, the description of north-western Mongolia, by Pyevtsoff, being the best work on the subject. In 1888, after the sudden death of Prjevalsky, Pyevtsoff was nominated head of the Tibet expedition, and, in company with Roborovsky and Kozloff and the geologist Bogdanovich, he explored during two years eastern Turkestan and the Gobi—the results of these explorations being now embodied in three quarto volumes edited by the Russian Geographical Society. Pyevtsoff also contributed to theoretical geodesy an important paper on the determination of latitudes from the corresponding altitudes of two stars—a most useful extension of M. Tsinger's method, which has been largely applied since by Russian explorers in Central Asia—and another on barometrical levellings.

THE series of Saturday afternoon excursions of the London Geological Field Class, conducted by Prof. H. G. Seeley, F.R.S., will commence on April 26, when a visit will be paid to Erith. The excursions will be continued on each succeeding Saturday (except on Saturdays before Whitsuntide and in Coronation week) until July 12. Further particulars can be obtained from the hon. general secretary, Mr. R. Herbert Bentley, 43 Gloucester Road, Brownswood Park, N.

DR. H. R. MILL has collected observations relating to the frost of February last from all available sources, and has published in Symons's *Meteorological Magazine* for March an interesting summary of the results, with a sketch-map which shows diagrammatically the number of days of frost in different parts of the country. With the exception of the long-continued cold of

February 1895, the recent frost was the most prolonged and severe that has been experienced in February for half a century. Dr. Mill measures the duration of the frost by the number of nights during which the temperature in the shade fell below the freezing point. In most places the cold weather set in on the 1st, and, generally speaking, lasted for three weeks, except on the sea coasts. For instance, at Torquay the period was nine days, at Eastbourne and some other places twelve days only, while in Suffolk, Yorkshire and Peebleshire the frost lasted for twenty-four days. The lowest shade temperatures were −2° at Lairg (Sutherland) and 0° at Braemar on the 14th. At Camden Square the minimum was 15°·8, the only lower records there in February being 15°·4 in 1865 and 7°·3 in 1895. The mean temperature of the month appears to have been from 3° to 5° below the average in all parts of our islands. Heavy snowfalls occurred in the north and west, but in the south-east there was an almost entire absence of precipitation during the period of the frost.

The *Scientific American* for March 8 describes and illustrates a very novel form of flying machine which has been devised by M. Henri Villard, of Paris. The machine has not yet been tried, so at present nothing can be said about its capabilities, but the inventor hopes to carry out the first trials next spring. An idea of the apparatus may be perhaps best explained by imagining a rather flat umbrella of considerable size made rigid by an exterior steel rim and wire spokes. On the stick portion of this large umbrella, and under the umbrella, are two projecting arms, one carrying a screw to move the apparatus in a horizontal direction, the other a rudder for steering purposes. Still lower down on this stick, on one side of it, say near the handle of the umbrella, is the motor, and opposite it the seat for the operator. The motor has two functions, one of which is to drive the screw for obtaining the horizontal motion, and the other, which is the novel part of this form of flying machine, for rotating at a rapid speed the umbrella portion. The idea is that the rapidly rotating umbrella with the comparatively heavy rim will act like the wheel of a gyroscope, and that this will tend to keep the machine from being easily moved out of the plane of rotation. The umbrella portion, which is practically a parachute, is a large flat wheel of twenty-two feet external diameter, resembling somewhat a bicycle wheel, the rim of which is made of half-inch diameter circular steel tubing, and this is covered on its upper portion with stout cotton balloon canvas. The parachute or wheel portion is not really a true wheel, but built on the plan of a helix, so that by rapid rotation the whole apparatus can be lifted vertically; it is stated that this will absorb about four horse-power.

An ingenious and very convenient method for finding the velocity of underground water is described by Prof. Slichter in the *Engineering News*. The method is an electrical one, and consists in determining the time taken for an electrolyte to travel along a certain length of the stream. A double row of 1¼ inch drive wells is sunk across the channel of the stream and the upstream wells are charged with a solution of an electrolyte, ammonium chloride having been found very suitable. The electrolyte flows down stream with the moving water, and its arrival at the second row of drive wells is indicated electrically. The best method of connecting up the electrical indicator is said to be the following. One pole of the battery is connected to the outer sheathing of the lower well tubes through an ammeter; the other pole is connected to the upstream tubes and also to an insulated electrode passing down the centre of the downstream tubes. A gradual rise in current marks the passage of the electrolyte down stream; when it arrives at the lower row of wells, the resistance of the circuit between the sheathing and the inner electrode is so much diminished that a sudden kick of the ammeter occurs, marking with great precision the time of arrival. The second circuit may be dispensed with, but the moment of arrival is not in that case so sharply marked. A number of preliminary tests have been made on the rate of movement of the underflow of the Arkansas River, and a more extended and systematic survey is now being undertaken.

In a paper recently contributed to the Royal Dublin Society, Prof. Johnson, of the Royal College of Science, directs attention to the great injury done by "smut" (*Ustilago avenae*, Jens.) to the oat crop in Ireland, and as the result of two years' experience strongly recommends the use of an American fungicide, "Sar." Sar—so-called because of the ingredients, sulphur, alkali and resin, used in its preparation—consists chiefly of sodium sulphide, and to this compound the fungicidal properties are due. Sar can be made at a cost of 6*d.* to 9*d.* per pint; and one pint in 30 to 40 gallons of water will cleanse 4 bushels of seed. The grain must be soaked for 24 hours, and for ordinary farm use it would be necessary to provide a tank capable of dealing with one day's supply of seed, say 30 to 50 bushels. Smut is a widespread pest in Britain, but partly because in normal seasons it does not do serious damage, and partly because of the unsuitability of the farmer's ordinary "steep" (solution of copper sulphate) and the trouble attending the use of Jensen's "hot-water" method, few attempts have hitherto been made to deal with the fungus. Prof. Johnson's paper should secure an extended trial for sar in Wales, the west of Scotland, and other moist districts where *Ustilago avenae* is common.

Following the example set more than a decade ago by the Government of New South Wales, the Agricultural Department of the Government of Victoria has begun the issue of a monthly journal. In the first part, dated January 1902, the scope of this publication is indicated in an introduction written by the Hon. John Morrissey, M.L.A., Minister for Agriculture. The chief function is to bring the officers of the Department into closer touch with the agricultural population. A considerable body of information is accumulated by the experts employed by Government, and it is felt that unless this information is in active circulation it will prove of little value. An annual report does not meet the farmer's requirements, for "the annual must ever be largely a review, which in daily practice is not so much wanted as the forecast, and this the journal will aim to furnish." The thirty or so articles and notes contributed to the first number by the officers of the Department are direct, practical, freely illustrated, and well calculated to assist the agriculturist. They deal with such subjects as uses of demonstration plots, registration of remounts, best types of vat for wine-making, cream-testing, and inspection of exported butter. The journal is under the editorship of Mr. H. W. Potts. It is well arranged and well printed. It promises to be of much value to the colony.

The British Mycological Society has just issued its transactions relating to the week's fungus foray held at Exeter in September of last year, and the papers read at the evening meetings. The most successful find was *Femsjonia luteoalba*, a genus belonging to the Tremellineæ, and one up to that time unrecorded for Britain. It was found growing on oak and birch. A paper was read by Mr. B. T. P. Baker, of Cambridge, giving some results of his cultures with Saccharomyces, which were undertaken to determine the conditions regulating spore formation. The cultures were made on plaster of Paris blocks treated with various solutions. The results seem to confirm the views put forward by Heinsen that aëration is the most important condition which regulates the production of spores. The amount of food present is also another determining factor and one which reacts differently with the two species, *S. cerevisieae* and *anomalus*, with which Mr. Baker experimented.

S. cerevisieae forms spores when it is starved, but *S. anomalus*, contrary to the generally accepted ideas, gives a bigger spore yield as the amount of food is increased. Botanists who wish to obtain spores for class work or otherwise will also do well to note that cells of the yeast will only give a good supply of spores when they are about twenty-four hours old, and none at all when they are two days old or more.

PROF. MARSHALL WARD, F.R.S., has summarised for the British Mycological Society a few of the important results which he has obtained in the course of his studies on the susceptibility of different species of brome-grasses to the attacks of the rust fungus (*Puccinia dispersa*). The development of the fungus from the uredospore when taken from one species of Bromus and transferred to another species is found to differ according to the relationship of the two Bromes. If these are closely related, the fungus infects and grows rapidly, whereas a more remote species may be entirely immune from infection. By means of carefully devised apparatus, Prof. Ward has raised pure cultures of grass from sterilised seed in germ-free tubes, and has thus been able to demonstrate that seeds from infected plants are entirely free from disease, thereby proving fairly conclusively the impossibility of intra-seminal sources of infection.

A "CATALOGUE of Altitudes in Asiatic Russia and some adjacent Portions of Asia, on the Basis of Materials Published up to 1894," by Dr. K. Hikisch, appears in the *Memoirs* of the Russian Geographical Society (General Geography, vol. xxxi., 2). The catalogue contains a very valuable list of 11,629 determinations of altitudes in Asiatic Russia, as also in Russian and Chinese Turkestan, Mongolia and Manchuria, published in the same form as they were issued by the respective authors. Unfortunately there remains still an uncertainty of about 100 feet in the altitudes of the fundamental points for most determinations—Irkutsk in Siberia and Tashkend in Turkestan. An alphabetical index of all the names considerably facilitates reference to this catalogue.

MR. JOHN CADMAN has prepared a useful account of the occurrence, mode of working and treatment of the ironstones found in the North Staffordshire Coal-field (*Trans.* Inst. Mining Engineers for 1901). The blackband ironstones occur in the upper portion of the Coal-measures beneath the Etruria Marls; they overlie seams of coal, and the thickness of the coal frequently varies in inverse ratio to the thickness of the ironstone. Sometimes the ironstones assume the nature of cannel coal, and occasionally they pass into limestone. Many fossils have been found in the ironstones, and notably through the researches of Mr. John Ward, but the mollusc Anthracomya is the prevailing shell.

THE geology of the "Riukiu Curve," or of that series of islands which lies between Formosa and Kyūshū in Japan, has been dealt with by Prof. S. Yoshiwara (*Journ.* Coll. Science, Tokyo, Japan, vol. xvi. 1901). The principal rocks of the islands are of Palæozoic age, and comprise slate, sandstone, quartzite and limestone, with amphibolite and schalstein. The ancient sedimentary rocks dip steeply to the west, and are penetrated in places by masses of granite and diorite. They form a median zone in the series of islands. The inner zone in the curve is formed mainly by volcanic rocks, and the outer zone by Tertiary strata of Miocene and later stages, which contain coal-seams and are here and there rather irregularly inclined. Raised coral-reefs are found in various districts, and these are quite horizontal. The maximum elevation of the reefs is 684 feet; they exhibit a character like those now growing in adjacent seas, and they have been upheaved after a gradual depression. The formation of the curve has been explained by Prof. Kotô as due to the depression of the "East Sea" of China, which took place for the most part in the Tertiary period. The volcanic rocks appear to belong to somewhat different stages in that period and to have originated along a great fissure which is continued in the volcanoes of Kyūshū.

THE Royal Zoological Society of Ireland has published a short account of its origin and early history. The author, Dr. D. J. Cunningham, has to lament the absence of documentary evidence, or the extreme incompleteness of such evidence, as to much of the early history of the Society; but in spite of this he has managed to bring together a number of interesting facts in connection with its foundation, and also gives portraits of some of the most prominent among the founders. The Society was established in May, 1830, at a meeting presided over by the Duke of Leinster, Dr. Whitley Stokes being elected the first hon. secretary at the second meeting, held later in the same month. It is interesting to note that the eminent ornithologist Mr. N. A. Vigors, who three years later became the first hon. secretary of the London Zoological Society, took a prominent part in the organisation of the Dublin institution.

OF the five articles included in part iv. of vol. xxix. of Gegenbaur's *Morphologisches Jahrbuch*, four are devoted to mammalian anatomy. In the longest, Herr G. Ruge discusses the varieties of form displayed by the liver of the Primates. The author considers that the mammalian liver was always divided into lobes, and was never, as has been suggested, a simple organ. Some emendation is made in the nomenclature of the lobes, and the homology of the aberrant "spigelian" and "caudal" lobes worked out. In another article, Dr. E. Stromer considers the morphological importance of the foramen found at the lower end of the humerus of many mammals and likewise of the third trochanter of the femur. From its occurrence in so many of the lower types, the entepicondylar foramen, as it is called, is regarded as a primitive structure, of which the original object was to protect certain nerves and blood-vessels. It is remarkable that it should persist in the spectacled bear of the Andes, although it has disappeared in all other living members of the group. The third trochanter of the femur, on the other hand, can scarcely be regarded as primitive, seeing that it is wanting in several of the lower groups of mammals. Neither can its presence be attributed, as Gaudry suggests, to the reduction in the number of the toes, as otherwise it should not be found in the rhinoceros. Its general absence in man forbids the idea of its having any connection with the upright posture.

THE important position occupied by the science of bacteriology in the United States may be gathered from the existence of an American Society of Bacteriologists, which has already held no less than three annual meetings. The last meeting of the society's members was held at the end of last and beginning of this year in Chicago, and a recent number of *Science* contains abstracts of the papers read. A great variety of subjects was dealt with, amongst which dairy bacteriology is well represented by contributions from Mr. H. L. Russell amongst other well-known authorities in this branch of applied bacteriology. A useful paper, as emphasising the results obtained by other investigators in the same field, is contributed by Mr. Caleb A. Fuller on "Oysters and Sewage in Narragansett Bay." The author found that oysters from a bed two miles below the sewer outlet contained bacteria typical of sewage, that 30 per cent. of the oysters from a bed situated in a strong tidal current about five miles from the sewer contained *B. coli*, that 40 per cent. of the oysters from a bed in sluggish water five-and-a-quarter miles from the sewer contained *B. coli*, and that these objectionable bacilli were only absent from oysters in beds situated more than six miles from the sewer outfall. Dr. W. J. Class submits another claimant to the title of the scarlatina microbe, in the shape of a diplococcus said to be invariably present in cases of scarlatina and found in the throat secretions, blood, scales and urine of persons suffering from scarlet fever. He has spent much labour and time in endeavouring to place the title of this *Diplococcus scarlatinae* beyond dispute. The papers submitted, judging by the abstracts supplied by Prof. Conn, were of a high order, and the existence of such a society suggests that bacteriology in this country might well be accorded a more important place amongst the sciences than it at present occupies.

THE ninth edition of Mr. Bennett H. Brough's deservedly successful "Treatise on Mine-Surveying" has been published by Messrs. C. Griffin and Co. The book has been carefully revised, and new devices and appliances of importance are described. "The chief additions," we read, "consist of notices of the use of a spring balance for maintaining steel bands at a constant tension, of Mr. Langer's method of surveying with the hanging compass in the presence of iron, of Mr. Troye's method of marking underground stations, and of Mr. Landis's method of determining the volume excavated in open workings." By keeping his book up to date in this way, Mr. Brough makes his manual most valuable to mining students and mine-agents, who regard it as an essential volume for their libraries.

THE additions to the Zoological Society's Gardens during the past week include a Brown-headed Stork-billed Kingfisher (*Pelargopsis gurial*), an Eastern Calandra Lark (*Melanocorypha bimaculata*), an Eastern Linnet (*Acanthis fringillirostris*), a Glossy Calornis (*Calornis chalybeius*), a Small-billed Mountain Thrush (*Oreocincla dauma*), a Large Pied Wagtail (*Motacilla maderaspatensis*), an Ashy Wood Swallow (*Artamus fuscus*), a Bay-backed Shrike (*Lanius vittatus*), an Indian Great Reed Warbler (*Acrocephalus stentoreus*) from British India, a Pale Rose-finch (*Rhodospiza obsoleta*) from Afghanistan, presented by Mr. E. W. Harper; three Changeable Lizards (*Calotes versicolor*) from India, presented by Mr. R. C. McLaren; four Two-banded Monitors (*Varanus salvator*) from the East Indies, a Stump-tailed Lizard (*Trachydosaurus rugosus*) from Australia, four Changeable Lizards (*Calotes versicolor*) from India, twenty-four Black-spotted Lizards (*Algiroides nigro-punctatus*) from the Borders of the Adriatic, deposited; a Tasmanian Wolf (*Thylacinus cynocephalus*) from Tasmania, purchased; two Barbary Wild Sheep (*Ovis tragelaphus*) born in the Gardens.

OUR ASTRONOMICAL COLUMN.

DISTORTION OF SUN'S DISC AT HORIZON.—Prof. W. Prinz, of the Royal Observatory of Belgium (Brussels), has obtained several large-scale photographs of the setting sun, which show most distinctly the considerable deformation of the disc when near the horizon. The instrument employed was a photoheliograph by Steinheil. A reproduction of one of the photographs accompanies the note in *Mem. della Soc. degli Spettroscopisti Italiani*, vol. xxxi. pp. 36–39. In this case the ratio of the vertical diameter to the horizontal one is as 75 : 84 = 0·893.

THE CROONIAN LECTURE.[1]

A PECULIAR interest—the parallel of that which in the plant organism belongs to chlorophyll—attaches to hæmoglobin, for, unlike any other chemical component of the animal body, in virtue of its special chemical and physical attributes, this remarkable substance may in the strictest sense be said to possess a definite and unique physiological function.

The region of the solar spectrum which the author formerly investigated was that comprised between the lines F and Q (4861—3280). The question whether oxy-hæmoglobin presents definite absorption for light of shorter wave-lengths has since been examined. Soret, whose observations were not conducted with solutions of hæmoglobin, but merely with diluted blood, observing by the aid of his fluorescent eye-piece the cadmium spark spectrum, found that diluted blood, in addition to the absorption band in the extreme violet, exhibited two additional bands. One of these, coinciding with the 12th cadmium line (3247), he considered to be probably due to hæmoglobin; the other, coinciding with the 17th cadmium line (2743), he assumed to be caused by serum albumin, his observations having previously shown that all albuminous and albuminoid bodies, with the exception of gelatin, are characterised by an absorption band in the position of the 17th cadmium line.

Employing solutions of many times crystallised oxy-hæmoglobin of great purity and of varying concentration, and with the aid of the sparks of a powerful induction coil, the author has obtained a series of photographs of the cadmium spark spectrum with and without the interposition of the solutions. The examination of these photographs shows that solutions of oxy-hæmoglobin which are sufficiently transparent to allow the ultra-violet spectrum of cadmium to be photographed present no absorption bands corresponding either to the 14th or the 17th cadmium lines. The absorption band observed by Soret in correspondence with line 14 is, therefore, not due to the blood colouring matter, but to some other organic constituent present in the blood.

Having referred to his researches communicated to the Royal Society in June 1901, and illustrated the main facts by actual demonstrations, the author discussed (1) observations on the influence of temperature on the behaviour of oxy-hæmoglobin in the magnetic field; (2) observations on the ferro-magnetism of the ferro-albuminates.

He next dealt with the question of the specific conductivity of solutions of pure oxy-hæmoglobin. After a laborious investigation on this branch of the subject, the following conclusions were arrived at:—

(1) Although solutions of oxy-hæmoglobin possess a low conductivity, this is very much higher than has been found in the previous observations of Stewart, all of which were made at 5° C.

(2) The conductivity of solutions of oxy-hæmoglobin increases rapidly with increase of temperature, and undergoes remarkable and permanent changes when the solution is kept for even short periods at any temperature above 0° C.

These results explain the impossibility of obtaining data which can be considered trustworthy concerning the *absolute specific resistance* of solutions of oxy-hæmoglobin.

Continuing the researches contained in his first communication to the Royal Society on the results of the electrolysis of oxy-hæmoglobin, the author has found that when pure solutions of oxy-hæmoglobin are subjected to electrolysis, there occurs a separation of oxy-hæmoglobin in a colloidal, but perfectly soluble form. He has worked with currents of from 12 to 24 volts, and the intensity of the electrolysing current measured by a milliampere-meter placed in the circuit has varied in different experiments between 0·1 and 3·0 milliamperes.

By employing an electrolytic cell in which the anode is separated from the kathode by an animal membrane (sheep's intestine or pig's bladder), it is seen that the first action of the current is to cause a separation of colloidal hæmoglobin in the anode cell. This colloidal hæmoglobin falls as a beautiful red cloud, leaving a perfectly colourless, supernatant liquid. On stirring it instantly dissolves.

The further action of the current is to cause a rapid and entire transfer of the colloidal hæmoglobin from the anode to the kathode cell. With an electrolytic cell, of which each compartment had a width of 5 mm. and contained 2·5 c.c. of a 1 per cent. solution of O_2Hb, complete precipitation and transfer occurs within 60 minutes.

On reversing the direction of the current by means of a communicator, the hæmoglobin returns again in the direction of the positive current into the original cell from which it started.

The author adduced evidence which proves that the precipitated colloidal, but yet perfectly soluble, hæmoglobin represents the undecomposed molecule of the blood-colouring matter.

The probable nature of the process which occurs under the influence of the current was discussed, as well as the character o.

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[1] "On Certain Chemical and Physical Properties of Hæmoglobin" By Dr. Arthur Gamgee, F.R.S., Professor Emeritus of Physiology in the Owens College. Read before the Royal Society on March 13.